

What is claimed is:

- 1 1. A communications method for use in a communications system including at least one
2 network node and one end node, the method comprising:
 - 3 operating an end node to receive a fault signal indicating a network node fault;
 - 4 determining if the network node fault corresponds to a network node that is important to
5 routing of signals to or from said end node; and
 - 6 if it is determined that the network node fault corresponds to a network node that is
7 important to routing of signals to or from said end node, operating the end node to initiate an
8 operation to ameliorate the effect of the network node fault on said end node.
- 1 2. The method of claim 1, wherein said step of determining if the network node fault
2 corresponds to a network node that is important to routing of signals to or from said end node
3 includes:
 - 4 comparing network node information included in the received fault signal to stored
5 information identifying at least one network node important to routing of signals to or from said
6 end node.
- 1 3. The method of claim 2, further comprising:
 - 2 determining said operation to ameliorate the effect of the network node fault as a
3 function of information stored in said end node, said stored information relating to a plurality of
4 possible operations.
- 1 4. The method of claim 3, wherein said step of determining said operation to ameliorate the
2 effect of the network node fault is also performed as a function of the network node at which the
3 fault occurred with said operation being selected from a plurality of possible operations based on
4 both the type of fault and which one of a plurality of network nodes was the node at which the
5 fault occurred.
- 1 5. The method of claim 2, wherein said stored information identifying at least one network
2 node important to routing of signals to or from said end node includes:
 - 3 a list of network nodes important to the routing of signals to said end node.

- 1 6. The method of claim 5, wherein said stored information includes information identifying a
- 2 network node which is used by said end node as at least one of a Mobile IP home agent, a
- 3 Session Initiation Protocol proxy server, and a Session Initiation Protocol location registrar.

- 1 7. The method of claim 5, wherein said stored information includes information identifying a
- 2 network node which is used by said end node as an access node through which said end node is
- 3 coupled to other nodes in the communications network.

- 1 8. The method of claim 7, wherein the access node is a base station and wherein said end node
- 2 is a mobile device that is coupled to said base station by a wireless communications link.

- 1 9. The method of claim 2, further comprising the step of:
 - 2 dynamically generating at least a portion of said stored information identifying network
 - 3 nodes important to routing of signals to or from said end node from information included in
 - 4 signals sent to or from said end node.

- 1 10. The method of claim 9, wherein said step of dynamically generating at least a portion of
- 2 said stored information identifying network nodes includes:
 - 3 operating the end node to monitor for non-fault related signals and to generate at least
 - 4 some of said stored information from the monitored non-fault related signals.

- 1 11. The method of claim 10, wherein said non-fault related signals include session signaling
- 2 messages communicated to or from said end node.

- 1 12. The method of claim 10, wherein said non-fault related signals are routing messages.

- 1 13. The method of claim 1, wherein said operation to ameliorate the effect of the network fault
- 2 on said end node is a Mobile IP registration operation.

- 1 14. The method of claim 1, wherein said operation to ameliorate the effect of the network fault
- 2 on said end node is an end node state update operation.

- 1 15. The method of claim 1, further comprising the steps of:

2 sending a status request signal from a first network node to a second network node;
3 receiving a response to said status request signal; and
4 sending a network node fault signal to said end node when said response indicates a fault
5 condition.

1 16. The method of claim 1, further comprising the steps of:
2 periodically sending a status request signal from a first network node to a second
3 network node; and
4 sending a network node fault signal to said end node when a response to at least one of
5 said periodically received status request signals is not received.

1 17. The method of claim 16, further comprising the steps of:
2 maintaining a count of the number of consecutive status request signals sent to said
3 second node for which a response is not received; and
4 wherein said sending a network node fault signal is performed in response to determining
5 that said maintained count at least equals a threshold number.

1 18. The method of claim 1, further comprising the steps of:
2 receiving a fault signal at a first network node; and
3 sending a network node fault signal to said end node in response to receiving a fault
4 signal.

1 19. The method of claim 18, wherein said step of sending a network node fault signal includes
2 periodically sending fault signals to a plurality of end nodes at preselected time intervals.

1 20. The method of claim 19, further comprising:
2 operating at least some of said plurality of end nodes to monitor for fault signals at said
3 preselected time intervals but not between said preselected time intervals.

1 21. The method of claim 20, wherein said fault signals are messages, each message including at
2 least one IP packet.

1 22. The method of claim 1, wherein said fault signal is a multicast signal, the method further
2 comprising:

3 operating a plurality of additional end nodes to receive said fault signal; and

4 operating each of the additional end nodes, in said plurality of additional end nodes, to
5 determine if the network node fault corresponds to a network node that is important to routing of
6 messages to or from said additional end node.

1 23. The method of claim 22, further comprising:

2 operating each additional end node which determines that the network node fault

3 corresponds to a network node that is important to routing of messages to or from said additional
4 end node, to initiate an operation to ameliorate the effect of the network node fault on said
5 additional end node.

1 24. The method of claim 22, wherein each of said plurality of additional end nodes monitors
2 for said fault signal at periodic scheduled times.

1 25. A communications method for use in a communications system including at least one
2 network node and one end node, the method comprising:

3 operating an end node to receive a service interference notification signal indicating
4 interference with service at a network node;

5 determining if the indicated service interference corresponds to a network node that is
6 critical to said end node; and

7 if it is determined that the indicated network node service interference corresponds to a
8 network node that is critical to said end node, operating the end node to initiate an operation to
9 ameliorate the effect of the indicated network node service interference on said end node.

1 26. The communications method of claim 25, wherein said service interference notification
2 signal is a fault message indicating a service outage at said network node due to a network node
3 fault.

1 27. The method of claim 26, wherein said step of determining if the indicated service
2 interference corresponds to a network node that is critical to said end node includes:

3 comparing network node information included in the received message to stored
4 information identifying network nodes critical to said end node.

1 28. The method of claim 27, wherein a network node is critical to said end node if said network
2 node is necessary for proper routing of at least some signals to said end node.

1 29. The method of claim 25, wherein said step of determining said operation to ameliorate the
2 effect of the indicated network node service interference includes accessing stored information
3 listing a plurality of operations and selecting from the plurality of possible operations the
4 operation to be performed based on both the type of fault and which one of a plurality of
5 network nodes was the indicated network node at which the fault occurred.

1 30. The method of claim 29, wherein said stored information includes information identifying a
2 network node which is used by said end node as at least one of a Mobile IP home agent, a
3 Session Initiation Protocol proxy server and a Session Initiation Protocol location registrar.

1 31. The method of claim 25, wherein said end node is a mobile node connected by a wireless
2 communications link to an access node that is coupled to said indicated network node, said
3 mobile node including a stored list of critical nodes and actions to be taken to ameliorate the
4 effect of faults at said listed critical nodes.

1 32. The method of claim 31, further comprising:

2 generating at least a portion of said stored information identifying network nodes from at
3 least one of a Mobile IP agent solicitation message, Mobile IP agent advertisement message,
4 Mobile IP registration message and a Mobile IP registration reply message communicated
5 between said end node and said access node over the wireless communications link.

1 33. The method of claim 29, further comprising the step of:

2 dynamically generating at least a portion of said stored information identifying network
3 nodes critical to said end node from information included in signals sent to or from said end
4 node.

1 34. The method of claim 25, wherein said operation to ameliorate the effect of the network
2 fault on said end node is a Mobile IP registration operation.

1 35. The method of claim 25, further comprising:

2 operating said end node to monitor for service interference signals at preselected time
3 intervals but not between said preselected time intervals.

1 36. The method of claim 25, wherein said service interference signal is a multicast signal, the
2 method further comprising:

3 operating a plurality of additional end nodes to receive said service interference
4 notification signal; and

5 operating each of the additional end nodes, in said plurality of additional end nodes, to
6 determine if the indicated network node service interference corresponds to a network node that
7 is important to routing of messages to or from said additional end node.

1 37. The method of claim 36, further comprising:

2 operating each additional end node which determines that the service interference
3 notification signal corresponds to a network node that is important to routing of messages to or
4 from said additional end node, to initiate an operation to ameliorate the effect of the service
5 interference on said additional end node.

1 38. The communications method of claim 25, wherein said service interference notification
2 signal is a message indicating a scheduled service outage at said network node.

1 39. A communications device, comprising:

2 memory including a set of stored information indicating network nodes which are
3 necessary to proper routing of signals either to said communications device or from said
4 communications device to other network nodes;

5 receiver circuitry for receiving messages from network nodes including service
6 interference notification messages indicating service interference at a network node; and

7 means for processing received service interference notification messages to determine if
8 service interference indicated by a received network service interference notification message

9 indicates service interference at a network node necessary to proper routing of signals either to
10 said communications device or from said communications device to another network node.

1 40. The communications device of claim 38,
2 wherein said device is a portable device; and
3 wherein said receiver circuitry includes a radio receiver circuit.

1 41. The communications device of claim 40, further comprising:
2 means for controlling the communications device to monitor for said service interference
3 notification messages at preselected intervals but not between said preselected time intervals.

1 42. The communications device of claim 40, wherein said set of stored information includes
2 information identifying a network node which is used by said end node as at least one of a
3 Mobile IP home agent, a Session Initiation Protocol proxy server and a Session Initiation
4 Protocol location registrar.

1 43. The communications device of claim 42, further comprising:
2 means for generating at least a portion of said set of stored information indicating
3 network nodes which are necessary to proper routing of signals from at least one of a Mobile IP
4 signal and a Session Initiation Protocol signal.

1 44. The communications device of claim 43, wherein said communications device is a mobile
2 node connected by a wireless communications link to an access node that is coupled to said
3 indicated network node, said set of stored information including actions to be taken to
4 ameliorate the effect of faults at network nodes which are necessary to proper routing of IP
5 packets to said mobile node.

1 45. The communications device of claim 44, wherein one of said actions to be taken to
2 ameliorate the effect of faults at network nodes is a Mobile IP registration operation.